

## Claims

2 We claim:

- 4 1. A microarray of polymeric biomaterials comprising:  
5       a base comprising a cytophobic surface; and  
6        a plurality of discrete polymeric biomaterial elements non-covalently bound to  
7        said cytophobic surface.  
8  
9 2. A microarray of polymeric biomaterials comprising:  
10      a base comprising a cytophobic surface; and  
11      a plurality of discrete non-monolayer polymeric biomaterial elements bound to  
12        said cytophobic surface.  
13  
14 3. The microarray of claim 1 or 2, wherein said base comprises a material selected from the  
15       group consisting of glass, plastic, metal, ceramic, and combinations thereof.  
16  
17 4. The microarray of claim 1 or 2, wherein said cytophobic surface comprises a hydrogel.  
18  
19 5. The microarray of claim 4, wherein said hydrogel comprises a polymer selected from the  
20       group consisting of homopolymers of methacrylic acid esters, homopolymers of alkylene  
21       oxides, homopolymers of alkylene glycols, copolymers thereof, and mixtures thereof.  
22  
23 6. The microarray of claim 4, wherein said hydrogel comprises a polymer selected from the  
24       group consisting of poly(methyl methacrylate), poly(isobutyl methacrylate), poly(pentyl  
25       methacrylate), poly(2-hydroxy-ethyl methacrylate), copolymers thereof, and mixtures  
26       thereof.  
27  
28 7. The microarray of claim 4, wherein said hydrogel comprises a polymer selected from the  
29       group consisting of poly(ethylene oxide), poly(propylene 1,2-glycol), poly(propylene 1,3-  
30       glycol), copolymers thereof, and mixtures thereof.

- 1
- 2 8. The microarray of claim 1, wherein said polymeric biomaterial elements are bound to  
3 said cytophobic surface via a non-covalent interaction selected from the group consisting  
4 of chemical adsorption, hydrogen bonding, surface interpenetration, ionic bonding, van  
5 der Waals forces, hydrophobic interactions, magnetic interactions, dipole-dipole  
6 interactions, and combinations thereof.
- 7
- 8 9. The microarray of claim 2, wherein said polymeric biomaterial elements are bound to  
9 said cytophobic surface via an interaction selected from the group consisting of chemical  
10 adsorption, hydrogen bonding, surface interpenetration, covalent bonding, ionic bonding,  
11 van der Waals forces, hydrophobic interactions, magnetic interactions, dipole-dipole  
12 interactions, and combinations thereof.
- 13
- 14 10. The microarray of claim 1 or 2, wherein each of said polymeric biomaterial elements  
15 comprises at least one polymer selected from the group consisting of synthetic polymers,  
16 adducts thereof, and mixtures thereof.
- 17
- 18 11. The microarray of claim 10, wherein said synthetic polymers are selected from the group  
19 consisting of polyamides, polyphosphazenes, polypropylfumarates, synthetic poly(amino  
20 acids), polyethers, polyacetals, polycyanoacrylates, polyurethanes, polycarbonates,  
21 polyanhydrides, poly(ortho esters), polyhydroxyacids, polyesters, polyacrylates,  
22 ethylene-vinyl acetate polymers, cellulose acetates, polystyrenes, poly(vinyl chloride),  
23 poly(vinyl fluoride), poly(vinyl imidazole), poly(vinyl alcohol), and chlorosulphonated  
24 polyolefins.
- 25
- 26 12. The microarray of claim 10, wherein at least one of said polymeric biomaterial elements  
27 further comprises a compound selected from the group consisting of drugs, growth  
28 factors, combinatorial compounds, proteins, polysaccharides, polynucleotides, lipids,  
29 adducts thereof, and mixtures thereof.
- 30

- 1 13. The microarray of claim 12, wherein said compound is covalently bound to the synthetic  
2 polymer component or components of the polymeric biomaterial.

3

4 14. The microarray of claim 12, wherein said compound is non-covalently bound to the  
5 synthetic polymer component or components of the polymeric biomaterial.

6

7 15. The microarray of claim 1 or 2, wherein each of said polymeric biomaterial elements are  
8 between 10 and 1000  $\mu\text{m}$  in diameter.

9

10 16. The microarray of claim 1 or 2, wherein each of said polymeric biomaterial elements are  
11 between 50 and 500  $\mu\text{m}$  in diameter.

12

13 17. The microarray of claim 1 or 2, wherein said polymeric biomaterial elements are  
14 disposed at between 100 and 1200  $\mu\text{m}$  intervals in a rectangular microarray.

15

16 18. The microarray of claim 1 or 2, wherein said polymeric biomaterial elements are  
17 disposed at between 300 and 500  $\mu\text{m}$  intervals in a rectangular microarray.

18

19 19. The microarray of claim 1 or 2, wherein said polymeric biomaterial elements are present  
20 at a density on said cytophobic surface that ranges from 1 to 1,000 polymeric biomaterial  
21 elements per  $\text{cm}^2$ .

22

23 20. The microarray of claim 1 or 2, wherein said polymeric biomaterial elements are present  
24 at a density on said cytophobic surface that ranges from 10 to 100 polymeric biomaterial  
25 elements per  $\text{cm}^2$ .

26

27 21. A method for the high throughput screening of polymeric biomaterials for their ability to  
28 affect cellular behavior comprising:  
29       providing a microarray of polymeric biomaterial elements that are bound to a  
30 cytophobic surface;

contacting said microarray with a cell culture for a period of time sufficient to allow the cells to adhere to said polymeric biomaterial elements; and

assaying the cellular behavior for each polymeric biomaterial element of the microarray.

22. The method of claim 21, wherein said cytophobic surface comprises a hydrogel.
  23. The method of claim 22, wherein said hydrogel comprises a polymer selected from the group consisting of homopolymers of methacrylic acid esters, homopolymers of alkylene oxides, homopolymers of alkylene glycols, copolymers thereof, and mixtures thereof.
  24. The method of claim 22, wherein said hydrogel comprises a polymer selected from the group consisting of poly(methyl methacrylate), poly(isobutyl methacrylate), poly(pentyl methacrylate), poly(2-hydroxy-ethyl methacrylate), copolymers thereof, and mixtures thereof.
  25. The method of claim 22, wherein said hydrogel comprises a polymer selected from the group consisting of poly(ethylene oxide), poly(propylene 1,2-glycol), poly(propylene 1,3-glycol), copolymers thereof, and mixtures thereof.
  26. The method of claim 21, wherein said polymeric biomaterial elements are non-covalently bound to said cytophobic surface.
  27. The method of claim 26, wherein said polymeric biomaterial elements are bound to said cytophobic surface via a non-covalent interaction selected from the group consisting of chemical adsorption, hydrogen bonding, surface interpenetration, ionic bonding, van der Waals forces, hydrophobic interactions, magnetic interactions, dipole-dipole interactions, and combinations thereof

- 1 28. The method of claim 21, wherein said polymeric biomaterial elements are not  
2 monolayers.

3

4 29. The method of claim 21, wherein each of said polymeric biomaterial elements comprises  
5 at least one polymer selected from the group consisting of synthetic polymers, adducts  
6 thereof, and mixtures thereof.

7

8 30. The method of claim 29, wherein said synthetic polymers are selected from the group  
9 consisting of polyamides, polyphosphazenes, polypropylfumarates, synthetic poly(amino  
10 acids), polyethers, polyacetals, polycyanoacrylates, polyurethanes, polycarbonates,  
11 polyanhydrides, poly(ortho esters), polyhydroxyacids, polyesters, polyacrylates,  
12 ethylene-vinyl acetate polymers, cellulose acetates, polystyrenes, poly(vinyl chloride),  
13 poly(vinyl fluoride), poly(vinyl imidazole), poly(vinyl alcohol), and chlorosulphonated  
14 polyolefins.

15

16 31. The method of claim 29, wherein at least one of said polymeric biomaterial elements  
17 further comprises a compound selected from the group consisting of drugs, growth  
18 factors, combinatorial compounds, proteins, polysaccharides, polynucleotides, lipids,  
19 adducts thereof, and mixtures thereof.

20

21 32. The method of claim 31, wherein said compound is covalently bound to the synthetic  
22 polymer component or components of the polymeric biomaterial.

23

24 33. The method of claim 31, wherein said compound is non-covalently bound to the synthetic  
25 polymer component or components of the polymeric biomaterial.

26

27 34. The method of claim 21, wherein said polymeric biomaterial elements are between 10  
28 and 1000 µm in diameter.

29

- 1       35. The method of claim 21, wherein said polymeric biomaterial elements are between 50  
2                   and 500  $\mu\text{m}$  in diameter.
- 3
- 4       36. The method of claim 21, wherein:  
5                   said microarray is a rectangular microarray; and  
6                   said polymeric biomaterial elements are disposed at between 100 and 1200  $\mu\text{m}$   
7                   intervals on said cytophobic surface.
- 8
- 9       37. The method of claim 21, wherein:  
10                  said microarray is a rectangular microarray; and  
11                  said polymeric biomaterial elements are disposed at between 300 and 500  $\mu\text{m}$   
12                  intervals on said cytophobic surface.
- 13
- 14       38. The method of claim 21, wherein said polymeric biomaterial elements are present at a  
15                  density on said cytophobic surface that ranges from 1 to 1,000 polymeric biomaterial  
16                  elements per  $\text{cm}^2$ .
- 17
- 18       39. The method of claim 21, wherein said polymeric biomaterial elements are present at a  
19                  density on said cytophobic surface that ranges from 10 to 100 polymeric biomaterial  
20                  elements per  $\text{cm}^2$ .
- 21
- 22       40. The method of claim 21, wherein said cells are selected from the group consisting of  
23                  mammalian cells, bacterial cells, yeast cells, and plant cells.
- 24
- 25       41. The method of claim 21, wherein said cells are selected from the group of mammalian  
26                  cells consisting of chondrocytes, fibroblasts, connective tissue cells, epithelial cells,  
27                  endothelial cells, cancer cells, hepatocytes, islet cells, smooth muscle cells, skeletal  
28                  muscle cells, heart muscle cells, kidney cells, intestinal cells, organ cells, lymphocytes,  
29                  blood vessel cells, stem cells, human embryonic stem cells, and mesenchymal stem cells.
- 30

- 1       42. The method of claim 21, wherein the step of assaying comprises assaying for cellular  
2                          proliferation.
- 3
- 4       43. The method of claim 21, wherein the step of assaying comprises assaying for cellular  
5                          differentiation.
- 6
- 7       44. The method of claim 21, wherein the step of assaying comprises assaying for gene  
8                          expression.
- 9
- 10      45. A method of preparing a microarray of polymeric biomaterials comprising:  
11                          providing a base comprising a substrate surface;  
12                          providing polymeric biomaterials in a solvent selected from the group consisting  
13                          of dimethylformamide, dimethylsulfoxide, chloroform, and dichlorobenzene; and  
14                          depositing said polymeric biomaterials as a plurality of discrete elements on said  
15                          substrate surface using a robotic liquid handling device, wherein  
16                          said polymeric biomaterials are dissolved at a concentration of between 10  
17                          and 200 mg/ml in said solvent, and said substrate surface comprises a hydrogel.
- 18
- 19      46. The method of claim 45, wherein said liquid handling device deposits via pin fluid  
20                          deposition.
- 21
- 22      47. The method of claim 45, wherein said liquid handling device deposits via syringe  
23                          pumped fluid deposition.
- 24
- 25      48. The method of claim 45, wherein said liquid handling device deposits via piezoelectric  
26                          fluid deposition.
- 27
- 28      49. The method of claim 45, wherein said polymeric biomaterial elements are deposited as  
29                          drops of between 0.1 and 100 nl.
- 30

1       50. The method of claim 45, wherein said polymeric biomaterial elements are deposited as  
2           drops of between 1 and 10 nl.

3

4       51. A method for the high throughput screening of compounds for their ability to affect  
5           cellular behavior comprising:

6                 providing a microarray of polymeric biomaterial elements arranged on a  
7                 cytophobic surface;

8                 contacting said polymeric biomaterial elements with a cell culture for a period of  
9                 time sufficient to allow the cells to adhere to said polymeric biomaterial elements; and

10                 assaying the cellular behavior for each polymeric biomaterial element of the  
11                 microarray, wherein:

12                 at least one of said polymeric biomaterial elements comprises one of said  
13                 compounds.

14

15       52. The method of claim 51, wherein said compounds are drugs.

16

17       53. The method of claim 51, wherein said compounds belong to a synthetic combinatorial  
18                 library of compounds

19

20       54. The method of claim 51, wherein said compounds are selected from the group consisting  
21                 of proteins, polysaccharides, polynucleotides, lipids, adducts thereof, and mixtures  
22                 thereof.